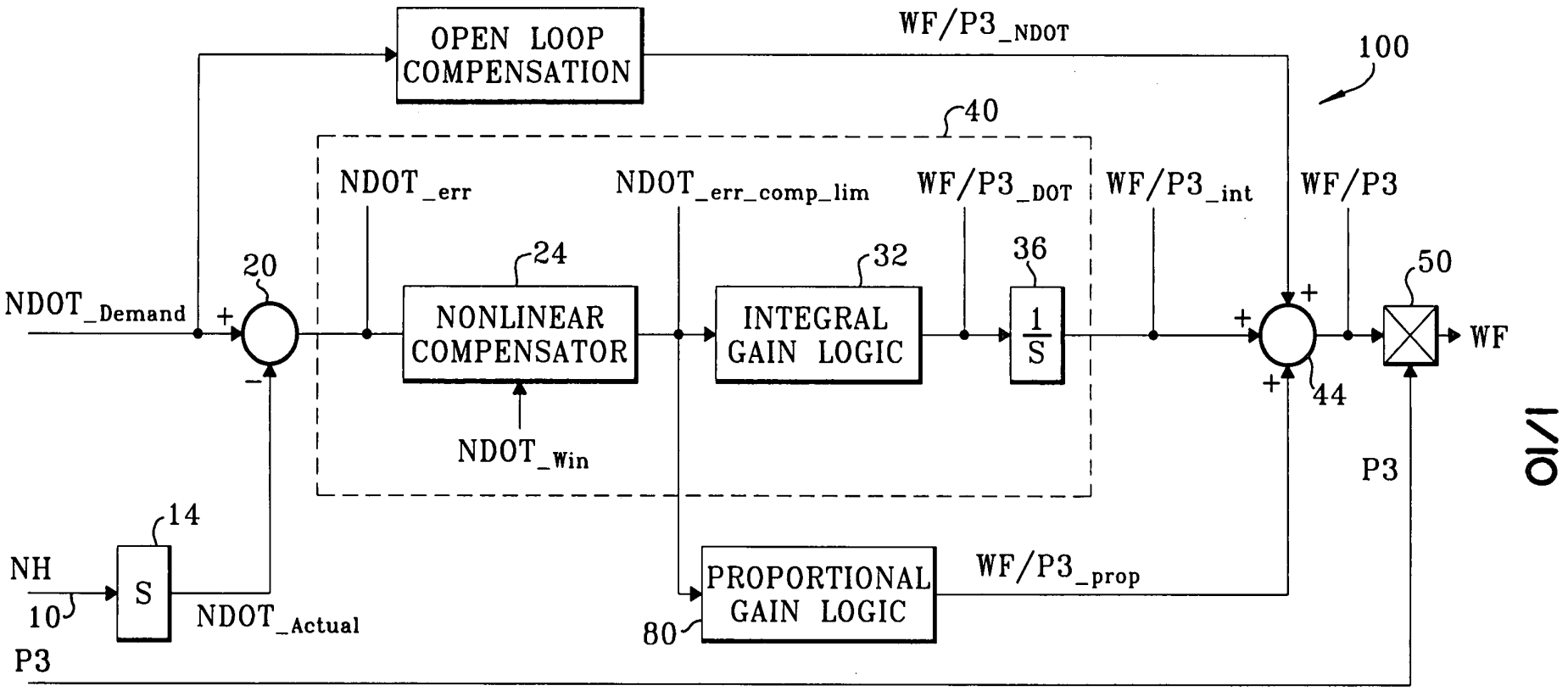

OPEN LOOP COMPENSATION
WF/P3_NDOT
100
40
NDOT_err
NDOT_err_comp_lim
WF/P3_DOT
WF/P3_int
WF/P3
20
24
32
36
50
NDOT_Demand
NONLINEAR COMPENSATOR
INTEGRAL GAIN LOGIC
1/S
WF
44
NDOT_Win
P3
14
NH
S
10
NDOT_Actual
PROPORTIONAL GAIN LOGIC
WF/P3_prop
80
P3

Fig. 1

1/1

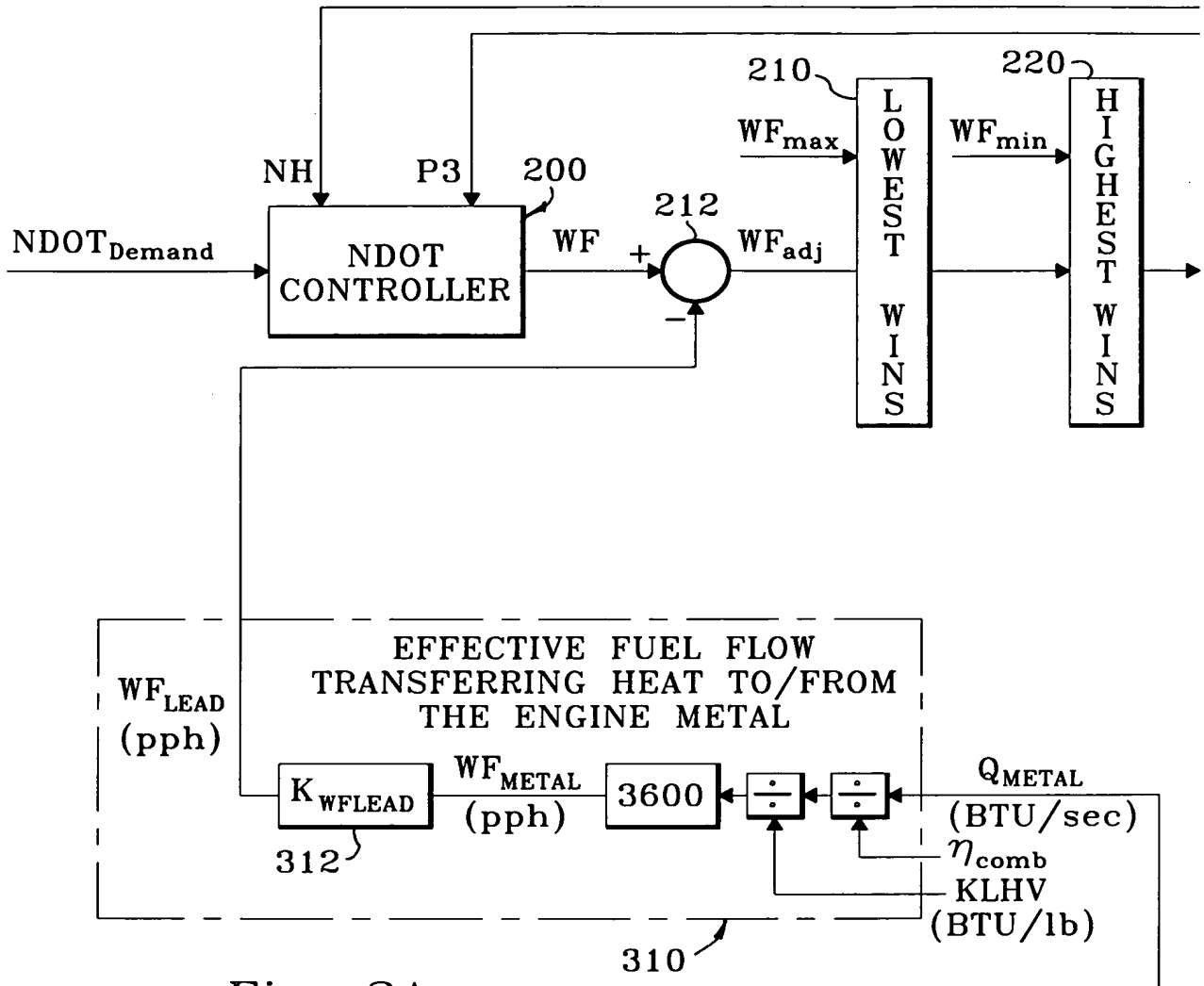


Fig. 2A

Fig. 2A	Fig. 2B	Fig. 2C

Fig. 2

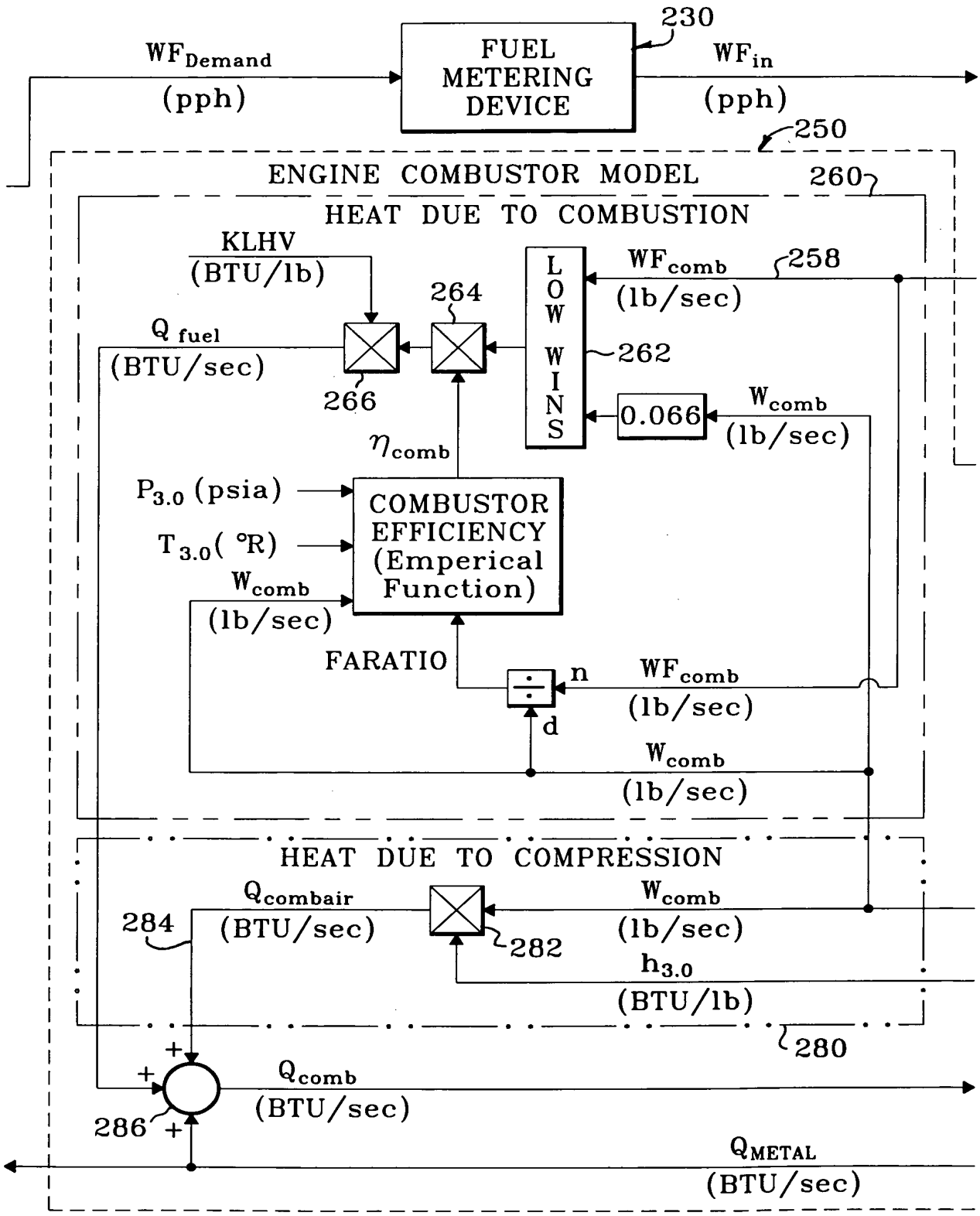

230
WF_{Demand}
(pph)
FUEL METERING DEVICE
WF_{in}
(pph)
250
ENGINE COMBUSTOR MODEL
260
HEAT DUE TO COMBUSTION
KLHV
(BTU/lb)
264
WF_{comb}
258
(lb/sec)
LOW WINS
262
Q_{fuel}
(BTU/sec)
266
0.066
W_{comb}
(lb/sec)
η_{comb}
$P_{3.0}$ (psia)
$T_{3.0}$(°R)
COMBUSTOR EFFICIENCY (Emperical Function)
W_{comb}
(lb/sec)
FARATIO
n
d
WF_{comb}
(lb/sec)
W_{comb}
(lb/sec)
HEAT DUE TO COMPRESSION
$Q_{combair}$
(BTU/sec)
284
W_{comb}
(lb/sec)
282
$h_{3.0}$
(BTU/lb)
280
+
+
286
+
Q_{comb}
(BTU/sec)
Q_{METAL}
(BTU/sec)

Fig. 2B

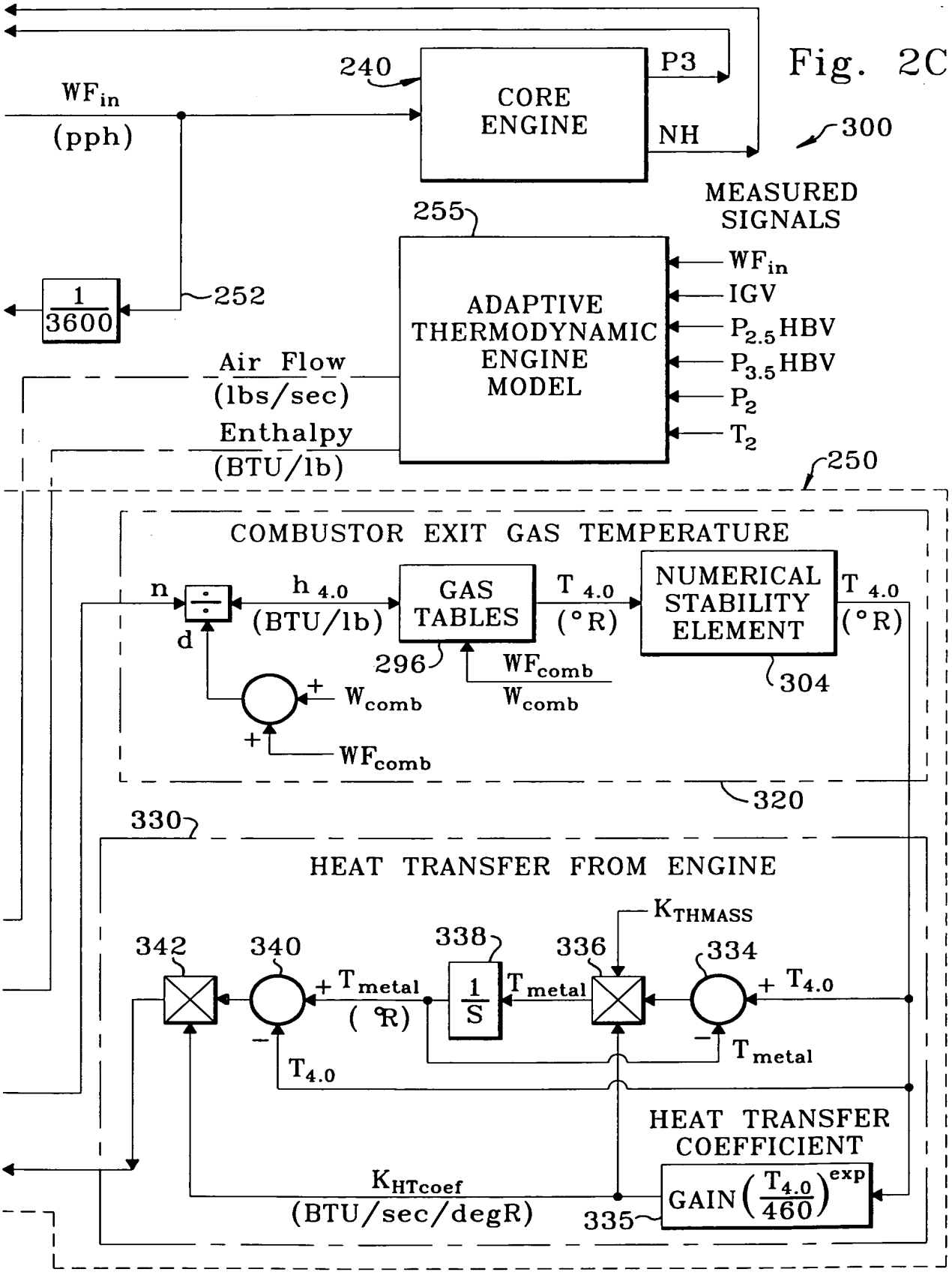

240
CORE ENGINE
P3
NH
300
WF in
(pph)
MEASURED SIGNALS
255
ADAPTIVE THERMODYNAMIC ENGINE MODEL
WF in
IGV
P2.5 HBV
P3.5 HBV
P2
T2
1/3600
252
Air Flow (lbs/sec)
Enthalpy (BTU/lb)
250
COMBUSTOR EXIT GAS TEMPERATURE
n
d
h 4.0 (BTU/lb)
GAS TABLES
296
T 4.0 (°R)
NUMERICAL STABILITY ELEMENT
304
T 4.0 (°R)
W comb
WF comb
320
330
HEAT TRANSFER FROM ENGINE
K THMASS
342
340
338
336
334
T metal (°R)
1/S
T4.0
HEAT TRANSFER COEFFICIENT
K HTcoef (BTU/sec/degR)
335
GAIN (T4.0/460)^exp

Fig. 2C

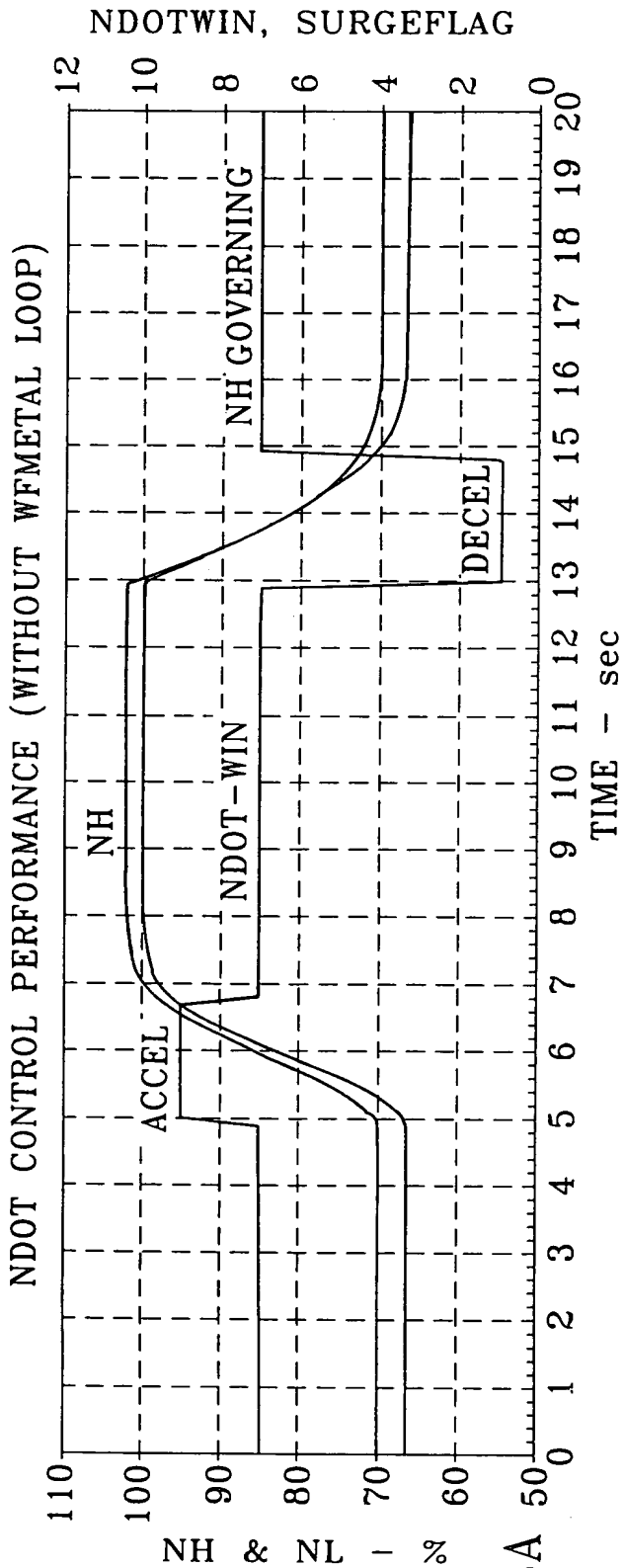

NDOTWIN, SURGEFLAG
NDOT CONTROL PERFORMANCE (WITHOUT WFMETAL LOOP)
NH GOVERNING
DECEL
NH
NDOT-WIN
ACCEL
TIME - sec
NH & NL - %

Fig. 3A

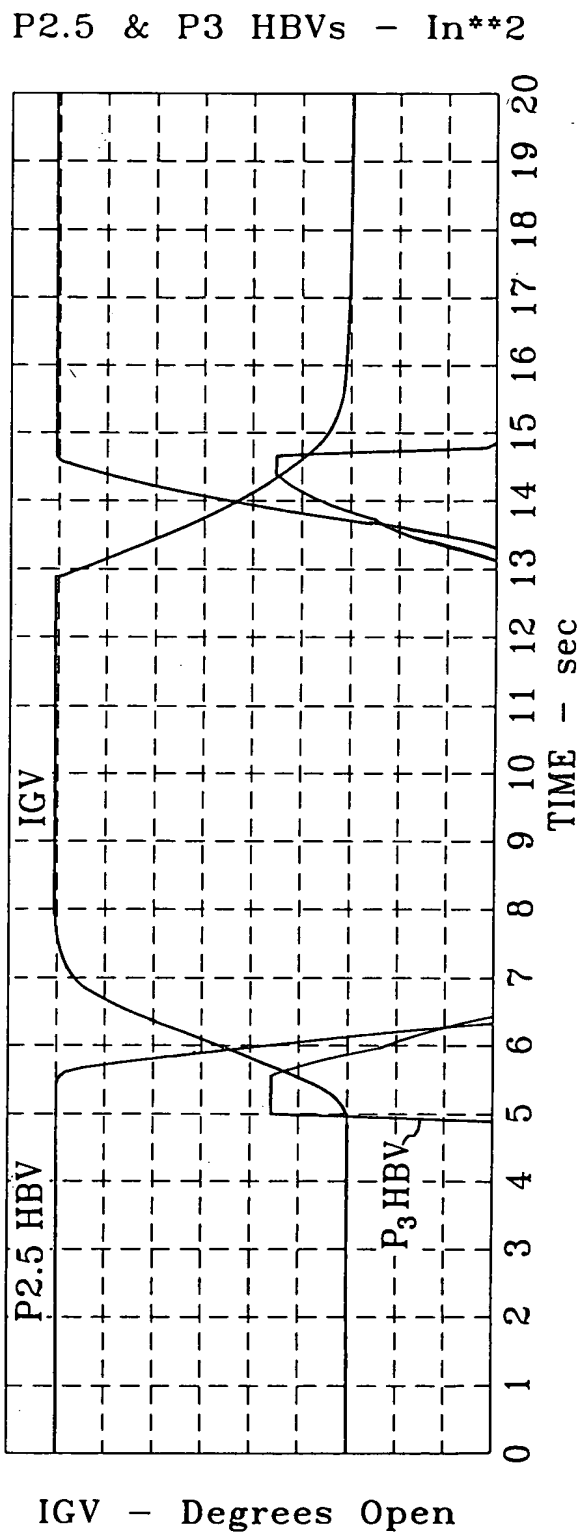

P2.5 & P3 HBVs - In**2
IGV
P2.5 HBV
P3 HBV
TIME - sec
IGV - Degrees Open

Fig. 3B

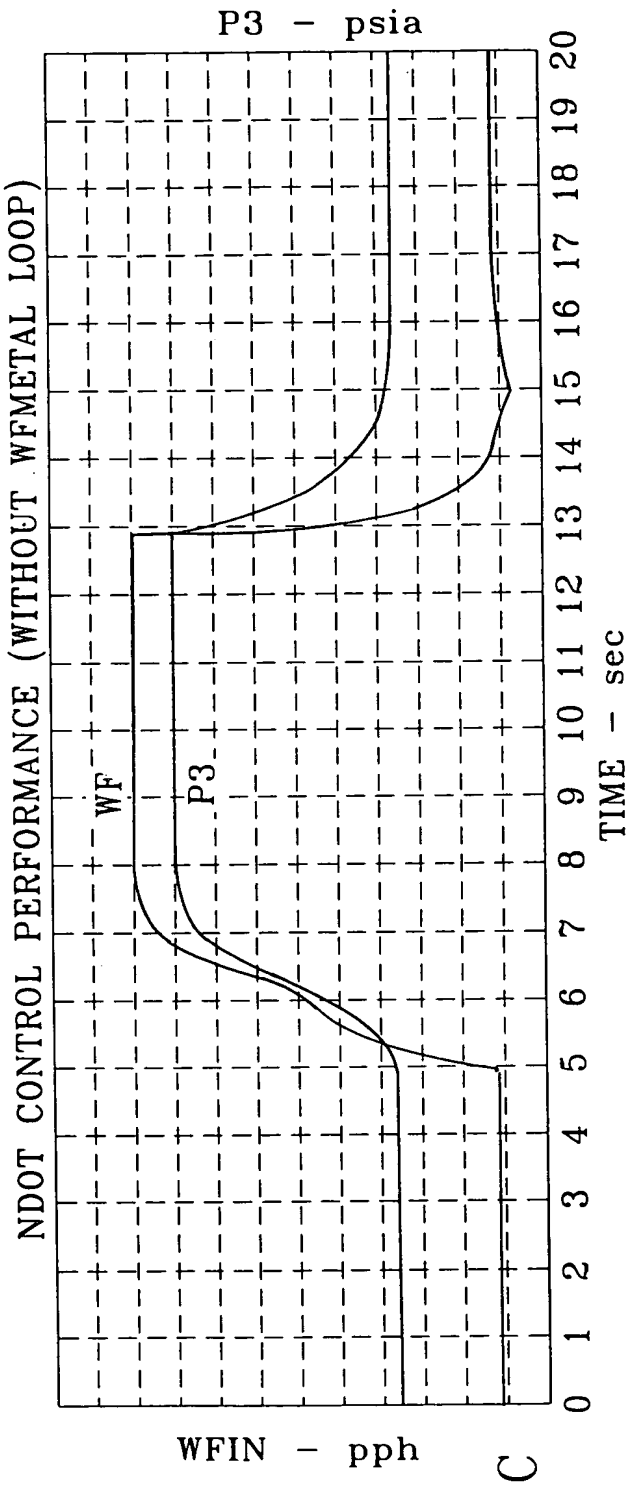

NDOT CONTROL PERFORMANCE (WITHOUT WFMETAL LOOP)
P3 - psia
WF
P3
TIME - sec
WFIN - pph

Fig. 3C

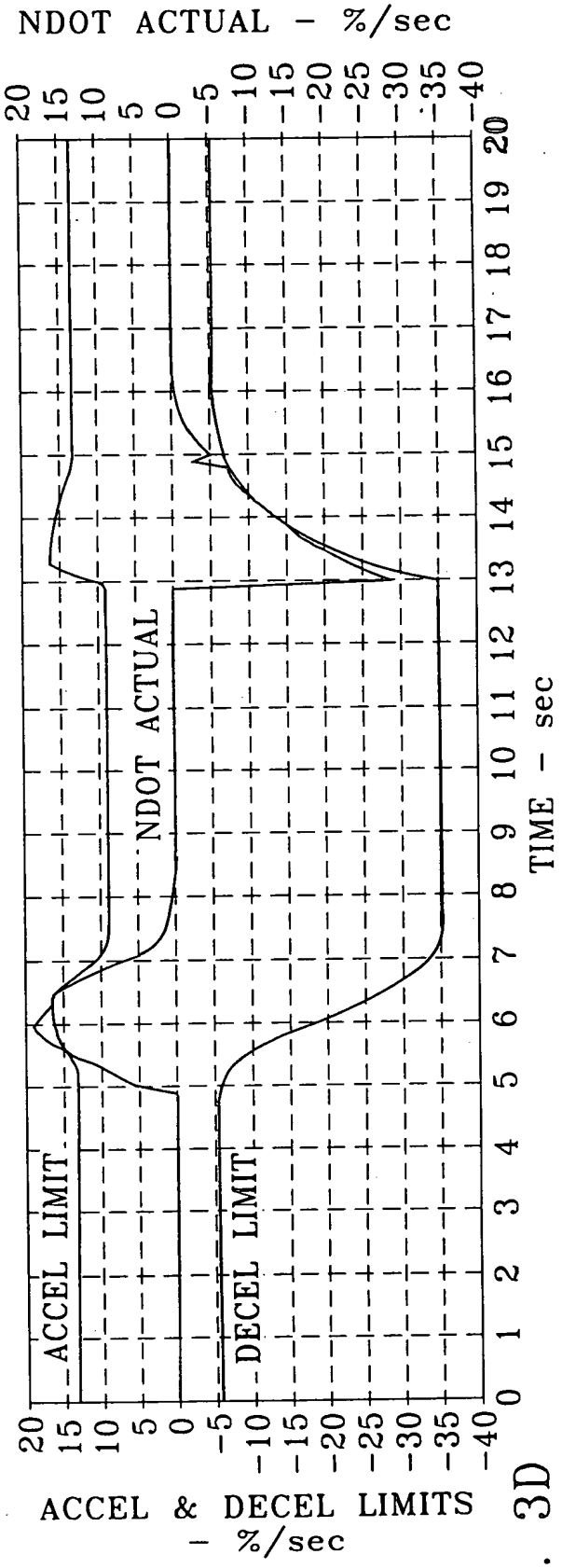
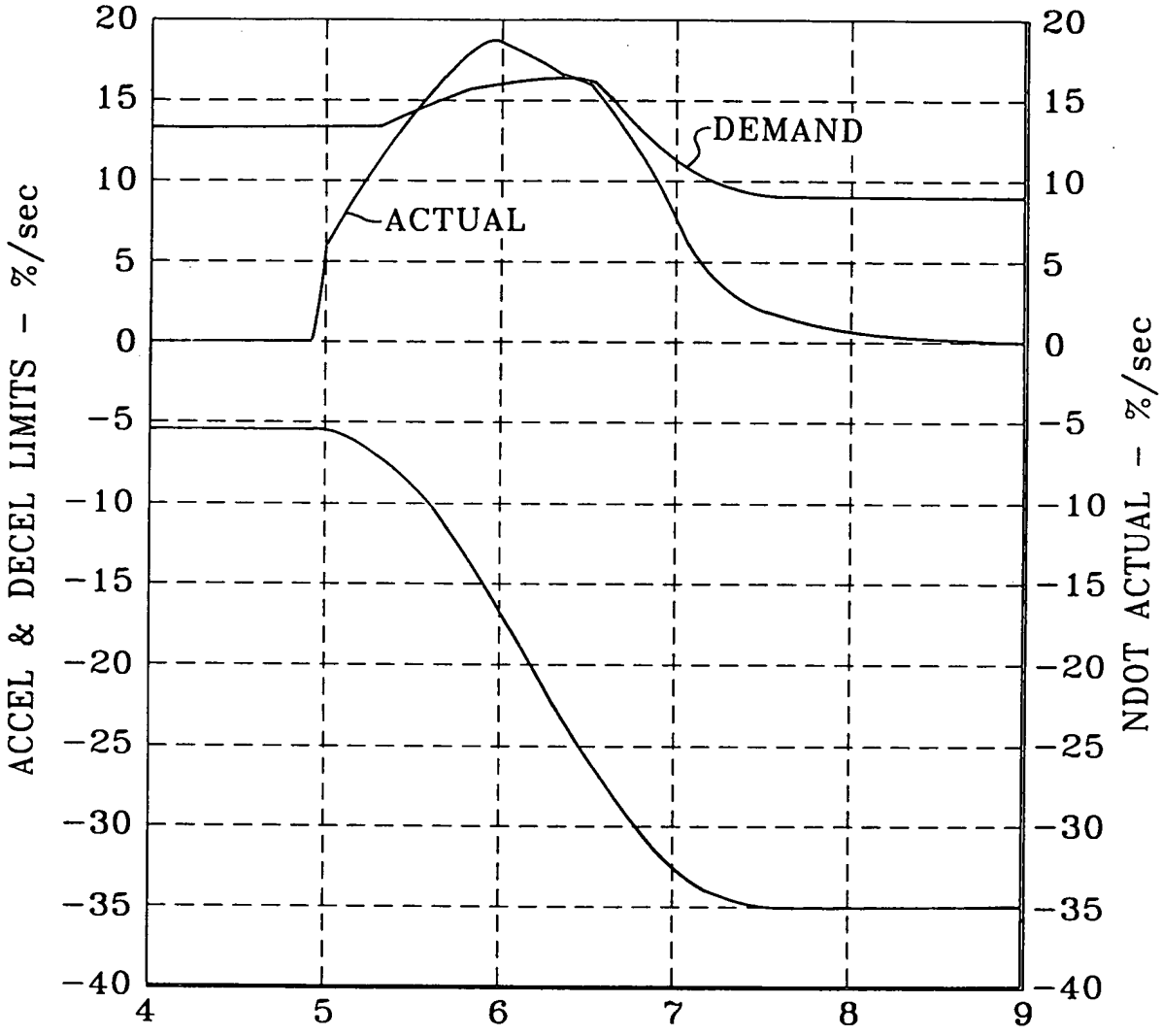

NDOT ACTUAL - %/sec
ACCEL LIMIT
DECEL LIMIT
NDOT ACTUAL
TIME - sec
ACCEL & DECEL LIMITS - %/sec

Fig. 3D



NDOT CONTROL PERFORMANCE
(WITHOUT WFMETAL LOOP)

Fig. 4

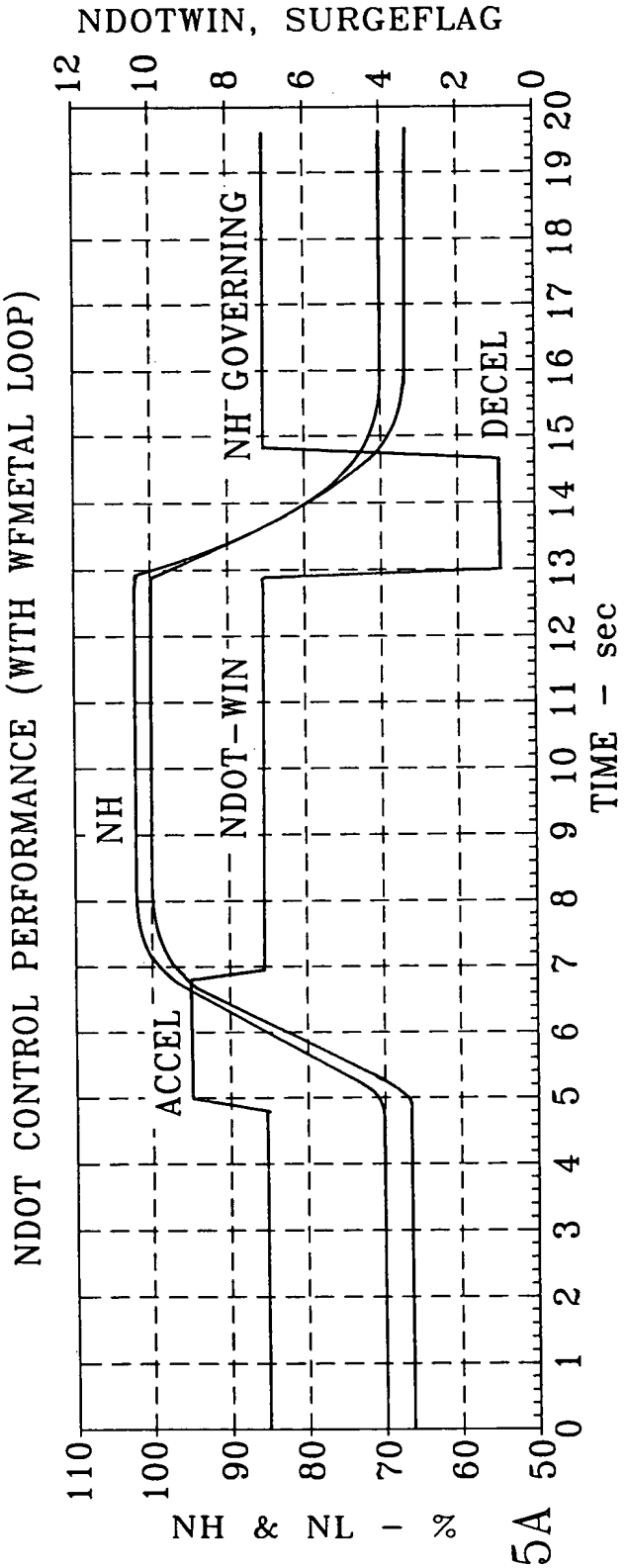

NDOTWIN, SURGEFLAG
NDOT CONTROL PERFORMANCE (WITH WFMETAL LOOP)
NH & NL - %
TIME - sec
NH
NDOT-WIN
ACCEL
NH GOVERNING
DECEL

Fig. 5A

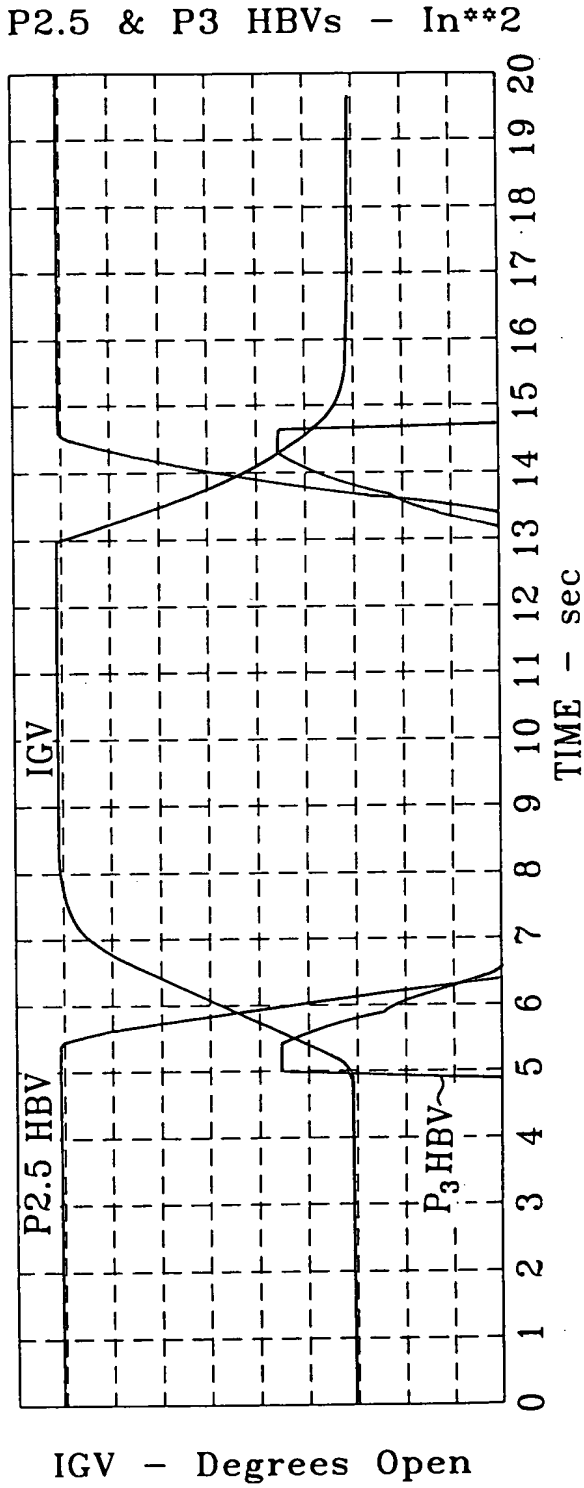

P2.5 & P3 HBVs - In**2
IGV - Degrees Open
TIME - sec
IGV
P2.5 HBV
P3 HBV

Fig. 5B

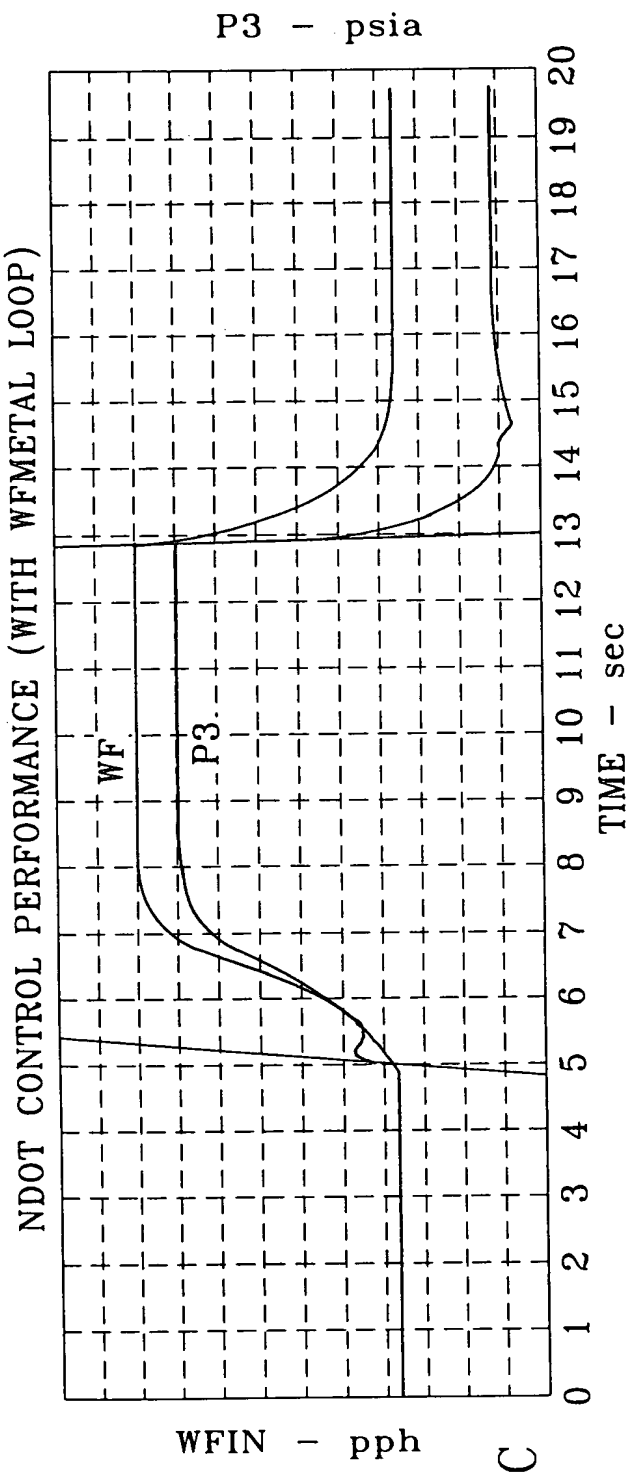

NDOT CONTROL PERFORMANCE (WITH WFMETAL LOOP)
P3 - psia
WF
P3
TIME - sec
WFIN - pph

Fig. 5C

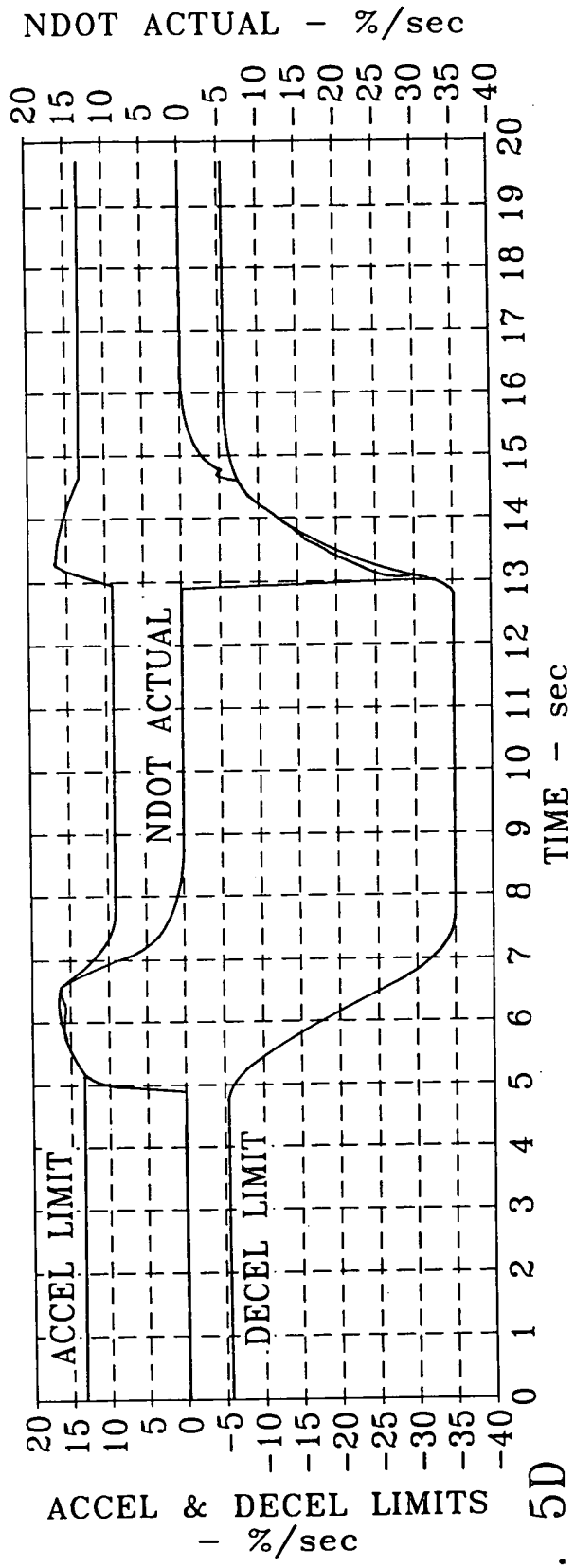
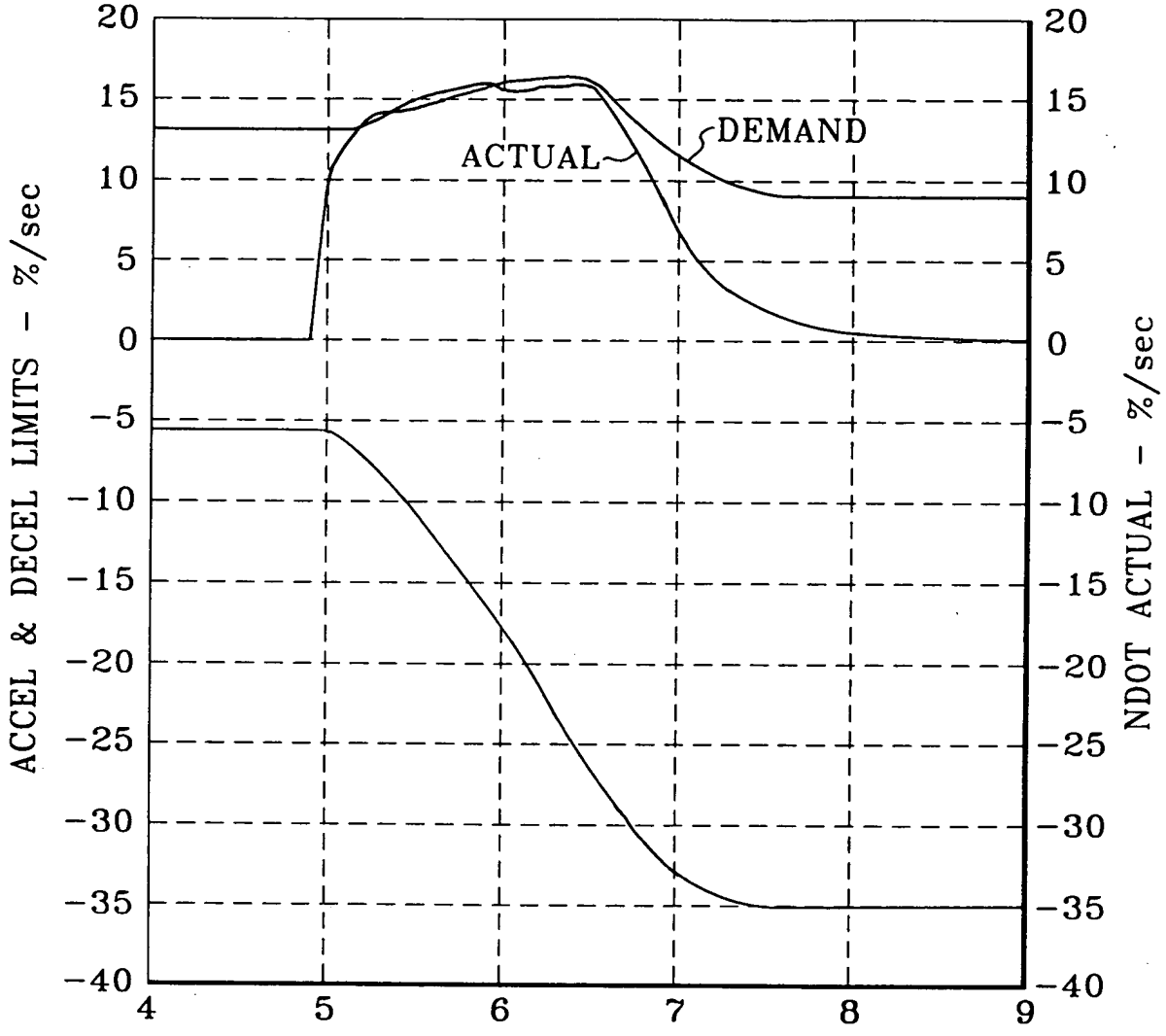

NDOT ACTUAL - %/sec
NDOT ACTUAL
ACCEL LIMIT
DECEL LIMIT
TIME - sec
ACCEL & DECEL LIMITS - %/sec

Fig. 5D



NDOT CONTROL PERFORMANCE
(WITH WFMETAL LOOP)

Fig. 6